SEEING WITH THE EAR

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HOUSE FOR THE BLIND

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AN INSTRUMENT to enable the blind to "see," or at least to appreciate differences in the intensity of light, by causing these differences to produce sound, has been devised by Mr. Fournier d'Albe, of Birmingham University, England. The instrument has been named by its inventor the optophone, and it is asserted that it will enable totally blind persons to recognize, locate, and even measure light by means of the ear. It is based upon the well-known property of selenium of changing its resistance under the action of light. A current from a small battery is sent through a network of four conductors known as a "Wheatstone bridge." Two are of ordinary wire, one is of selenium, and the fourth is adjustable. When the first two resistances are in the same ratio as the last two, then no current will flow across the network. But a current will flow as soon as one of the resistances changes, as does that of selenium under the action of light. It is this current, made audible in a telephone, which is utilized in the optophone. We quote an abstract of an article in *The English Mechanic*, appearing in *The Scientific American Supplement* (New York, August 3):

A BLIND MAN LISTENING TO THE FLAME OF A MATCH.
The inventor, Mr. Fournier d'Albe, on the extreme left.

"The instrument as exhibited consists of two parts. One of them is a pair of high-resistance telephones, as used for wireless telegraphy. The other is a long box, measuring 18 by 4 by 6 inches, which contains the selenium bridge, the battery, the wire resistances, two adjustable carbon resistances, and a clock-work interrupter. The last is there for the purpose of making the telephone current intermittent, as a continuous current is inaudible in the telephone.

"The method of using the optophone is as follows: The telephones are attached to the head, and the optophone box is carried in the right hand, connected by flexible wires with the telephones. On turning on the current and starting the clockwork, a ticking or rasping sound is heard in the telephones. This can be reduced to silence by adjusting the sliding carbon resistance, and by an auxiliary resistance giving a fine adjustment. That silence will continue so long as the light shining into the box remains of the same intensity; but a very slight change of illumination, either a brightening or darkening, suffices to restore the sound in the telephone, and the loudness of the sound produced measures the extent of the brightening or darkening of the light.

"In practise, it is found best to adjust the resistances so that the brightest light available produces silence, and then the various shades of darkness produce sounds of corresponding intensity.

"A striking experiment with the optophone is to point the box (it might be called a 'camera') to a window and adjust to silence. Then the hand, or other opaque object, passed across the open end, between the box and the window, indicates its passage by a sound in the telephone. You can hear it 'rasping' across the line of sight. Even a quick passage produces an audible sound. In sunlight or bright electric light the effect is very remarkable. Conversely, if the instrument is silenced for darkness, a light produces a sound whose loudness measures the intensity of the light. Moonlight is very audible, and the sun roars."

A very good idea of the extent to which the instrument helps the totally blind may be arrived at, the writer tells us, as follows: Make a long box of rectangular section, 4 by 6 inches, and 18 inches long, open at both ends. Insert a plate of ground-glass, 4 by 6 inches, in the center of the box, at right angles to the length, and a similar plate within one inch of one end. If a person puts this end against his eyes excluding all light except that which shines dimly through the ground-glass, he is very much in the position of a totally blind person armed with an optophone, except that he still recognizes light-intensities by means of the eye. He can locate windows and lights, and can, with a little practise, make his way by taking note of differences of shade. To quote further:

"As it stands, the optophone is of little use to those of the blind who suffer merely from the turbidity of the lens or humors of the eye. For they perceive, as a rule, as much light as is indicated by the optophone. But the instrument is only in its infancy, and can be immensely improved. Thus, instead of a single selenium bridge, a mosaic of bridges might be used, and the sounds from the various bridges might be distinguished by associating them with notes of various pitches. The world of light could thus be made to 'sing' of its glories to the blind. To rival the human eye, even only as regards the central spot of distinct vision, the mosaic would have to consist of at least 10,000 separate elements, and that appears at present almost hopeless. But there is no reason why the sense of touch, rather than the ear, should not be brought into play, especially as the blind already rely largely upon the sense of hearing to make up for the loss of sight. In that case, certain areas of the skin, with a totality of 10,000 nerve-endings, might be trained to take up the functions of sight. The retina is, after all, only specialized skin. In monocellular organisms the sense of sight is evenly diffused over the whole surface. A radical solution of the blind problem would have to be based on the first principles of sensation. If the skin elements specialized for sight refuse to function, other skin elements must be trained to do their duties. In some such way as that the problem may be completely solved eventually.

"But for the present, the optophone gives a first aid to the totally blind, bridging the gulf between them and the light, and opening up a new world to those who have never seen."

SHOP-SAFETY IN MOVING PICTURES—A campaign to teach principles and methods of safety in factories is being set on foot by the American Manufacturers' Association. Says a writer in *The American Machinist* (New York, July 25):

"At the recent convention of the association held in New York City, a number of films were shown dealing with personal safety and the prevention of industrial accidents. These included one intended to teach the unfortunate results of industrial accidents and the way in which they can occur if proper safeguards are neglected or thrust aside. Considerable sentiment was brought into the picture story by the actors. The convention

Courtesy of "The Scientific American"

AN INDIAN WOMAN, A WHITE BOY, AND A NEGRO PHOTOGRAPHED BY ORDINARY LIGHT.

THE SAME SUBJECTS PHOTOGRAPHED WITH INVISIBLE ULTRA-VIOLET LIGHT.

THIS PHOTOGRAPH WAS MADE WITH INFRA-RED LIGHT.

consisted of manufacturers, factory superintendents, and foremen. It is the purpose to show these and other similar films throughout the picture theaters of the country."

WHERE WHITE IS BLACK

THE DIFFERENCE between the white man and the negro, so far, at any rate, as mere color is concerned, vanishes in ultra-violet light. This light is invisible to the human eye, but it will affect the sensitive photographic plate, and photographs of white men and negroes taken by its means show faces that appear equally black. This is strikingly illustrated in the accompanying photographs, reproduced from *The Scientific American* (New York, July 27). Gustave Michaud and Fidel Tristan, of Costa Rica State College, who made the plates, contribute a description of them which uses their results as the basis of a theory of the origin of the white race. This theory proceeds on the assumption that the human race was once all black, and that white men are the descendants of individuals who were "bleached." Say these writers:

"Several hypotheses have been advanced to explain the difference in color between the southern and northern races of mankind. None is entirely satisfactory. It occurred to the writers that some progress might perhaps be made toward the solution of the problem if the relative absorption of light by the white and colored skins was considered not only for the visible radiations, but also for the invisible yet ever-present ultra-violet and infra-red lights.

"A group composed of a dark-skinned negro, an Indian woman of a chocolate color with perhaps an admixture of negro blood, and a white boy was photographed successively in visible light, in infra-red and ultra-violet lights. . . . . .

"The result was of a somewhat unexpected and confusing nature, and is clearly told by the accompanying three photographs. The difference in the absorbing power of the black and white skins decreases from the infra-red to the ultra-violet. In the infra-red it is by far greater than in visible light. In the ultra-violet it is almost *nil*. Indeed, it may be said that, if our eyes were sensitive to ultra-violet light only, all men would be negroes, so far as color is concerned.

"Some years ago one of the writers . . . ventured to explain the genesis of the white races of men through a process similar to that which bleached the fur of most northern animals which hunt or are hunted. During the whole Paleolithic and great part of the Neolithic ages man was ignorant of agriculture. In Abbeville, in Spy, in Mentone, in Hoxne, in the caves of Périgord, numberless flint or bone implements were found which prove that fact. The Paleolithic man was a hunter, and this being recognized, it becomes easier to explain how his color was changed, like that of other northward-migrating carnivora, than to explain the reason why he should have been an exception to the general rule. Primitive tribes were probably often decimated by hunger, as the Canadian Indians of to-day. Those hunters who exhibited on the snow a sallow face, black hair, beard, and eyes worked at a disadvantage when compared with somewhat lighter-complexioned comrades. They were more conspicuous on the white field, and could not so easily approach their prey within striking distance. When food was scarce, mortality was the greatest in their families; the lighter-complexioned individuals leaving in every generation the larger posterity. If that explanation holds good, it is rather easy to understand the reason why the selective process which decreased the absorption of visible light by the skin had no such influence on the invisible ultra-violet light. Why and how the same process should have deprived the white skin of the power of absorbing the warm and invisible infra-red radiations is by far more difficult to understand. It seems that such radiations are needed above all by the man who must withstand the effects of a cold climate. Yet the negro is the man whose skin is so organized that it can absorb them."

THE EVERGLADES DRAINAGE SCHEME

THAT THE RECLAMATION of the Everglades by drainage is being ignorantly and inadequately carried on by the State of Florida, under whose auspices it has been undertaken, is openly charged by *Engineering News* (New York, July 25). This paper asserts that those in charge of the enterprise actually do not know whether what they are doing will produce results that will pay for the money expended; that both they and the authorities behind them are "going it blind," and that meantime "reclaimed" swamp-land is being sold to unsuspecting purchasers at what are really high prices on the strength of the State's name. Says *The News:*

"It is a thousand pities that the State of Florida should lend its support to a huge land speculation and the sale of land on instalments to poor purchasers who can not afford to run risk of loss. For the State's whole drainage enterprise rests on an insecure foundation. Will the work now in progress on the canals from Lake Okechobee have sufficient effect in draining the Everglade region or any considerable part thereof so that the land can be lived upon and profitably cultivated? The sworn testimony of engineers of high standing in a recent investigation at Washington has proved conclusively that the State of Florida is proceeding blindly in this important matter. It has undertaken an engineering project involving the expenditure of several hundred thousand dollars, with no adequate engineering information as to whether the work will produce any results in the way of benefits at all commensurate with its cost. It is bad enough to spend the money of taxpayers on any such speculative basis, but it is ten times worse to allow the reputation and credit of the State to be made use of by land speculators to further the sale of lands on instalments at absurdly high prices to people of small means scattered all over the country.

"We feel it important to speak emphatically on this matter, for it is easy to foresee that a few years hence, when the bubble bursts and it is found that the construction work which has been done does not give the expected results, it will be attempted to lay the blame on the engineering profession. It will be then said that the engineering plans were at fault, and that the State authorities and the people who are selling these lands were themselves deceived.

"For the credit and good name of the engineering profession, therefore . . . we repeat what we said in our issue of March 28: The State of Florida should submit its present plans for draining the Everglades to a commission of competent engineers before proceeding farther."

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